FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**August 2021**
Programme	:	Diploma in Mechanical Engineering (DMEN)
Course	:	**EGM2181: Engineering Thermodynamics 2**
Date of Examination	:	6 December 2021 (Monday)
Time	:	8.00am – 10.30am Reading Time : Nil
Duration	:	2 Hours 30 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer all **FOUR (4)** questions. All questions carry equal marks.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Thermodynamics Tables

Examiner(s)	:	**Nur Hafizah Habideen**
Chief Moderator	:	Soo Swee Yoong

*This paper consists of **4** printed pages, including the cover page*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
EGM2181: ENGINEERING THERMODYNAMICS 2
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2021 SESSION

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Question 1

Below are the composition of gas mixture, determine:

- 8 kg of O_2
- 8 kg of N_2
- 10 kg of CO_2

(a) the mass fraction of each component,

(8 marks)

(b) the mole fraction of each component,

(13 marks)

(c) the average molar mass of the mixture,

(2 marks)

(d) the gas constant of the mixture.

(2 marks)

Question 2

Air enters a heating section at 95 kPa, 12°C, and 30 percent relative humidity. The volume flow rate of the air is 6 m^3/min. The exit temperature of the air is 25°C.

(a) Illustrate the heating and cooling diagram.

(4 marks)

(b) Determine the rate of heat transfer in the heating section.

(18 marks)

(c) Determine the relative humidity of the air at the exit.

(3 marks)

Question 3

(a) Propylene (C_3H_6) is burned with 150% theoretical air during a combustion process. Assuming complete combustion and a total pressure of 105 kPa, determine:

(i) the air–fuel ratio,

(6 marks)

(ii) the temperature at which the water vapor in the products will start condensing.

(3 marks)

(b) Octane (C_8H_{18}) is burned with dry air. Below is the volumetric analysis of the products:

- 9.21% CO_2
- 0.61% CO
- 7.06% O_2
- 83.12% N_2

(i) Determine the air–fuel ratio.

(11 marks)

(ii) Determine the percentage of theoretical air used.

(5 marks)

Question 4

A single acting reciprocating air compressor has cylinder diameter and stroke of 200 mm and 300 mm respectively. The compressor sucks air at 100 kPa and 27^{o}C. It operates at 100 rpm and delivers air at 800 kPa. Determine:

(a) the indicated power of the compressor,

(12 marks)

(b) the mass of air delivered by the compressor per minute,

(6 marks)

(c) the temperature of the air delivered by the compressor.

(7 marks)

Take polytropic index, n = 1.25 and R = 287 J/kg · K.

~THE END~